SNAP Computing R&D

Stu Loken

for Chuck McParland

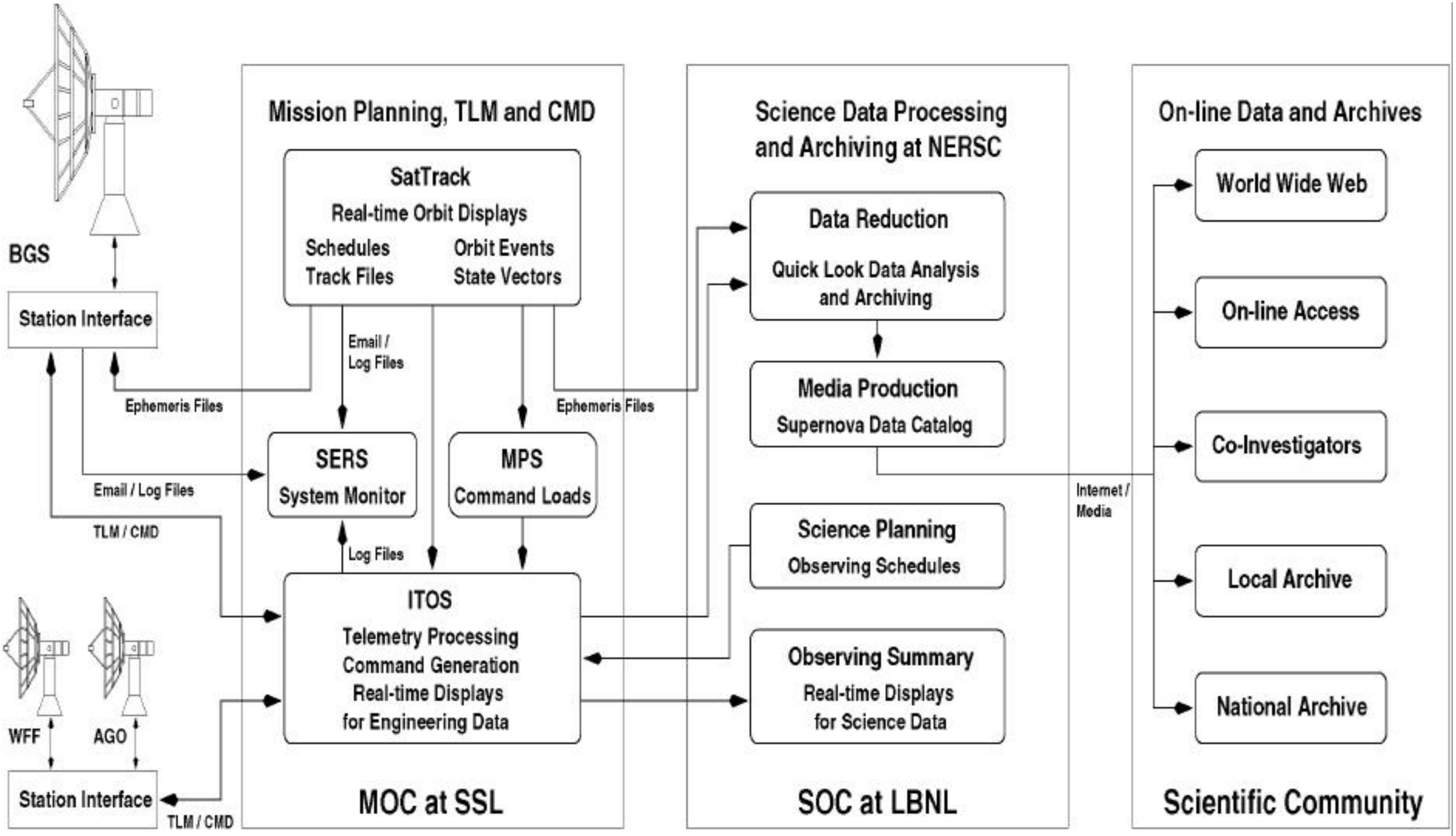
Computing Project Manager

and Chief Architect

Scope

- **Computing for Science Operations covers all computing and software from data acquisition electronics to data analysis and presentation**
- **Interfaces to instrument electronics and to Mission Operations and Satellite Control**

SNAP Data System



SNAP Ground Data System

Data Flow Layout

File: snap_gds.fig
M.Bester, 19Nov99

Computing Scale

- 1 GigaByte per exposure (every few hundred seconds)
- Data rate up to 50 Mbps
- Three years of running will give 50 M images and 600 TeraBytes of data
- Computing load to fit light curves for 2000 SNe is about 10 days (PIII 600)
- Fitting cosmological parameters will demand supercomputer power; 5 parameters takes 16 days at 3 TFLOPS

HENP Computing Challenges

Experiment	Data	Compute
E895 (AGS)	10 TB/yr	600 SPECint95
BaBar (SLAC)	400 TB/yr	5,000 SPECint95
STAR (RHIC)	266 TB/yr	10,100 SPECint95
PHENIX (RHIC)	700 TB/yr	8,500 SPECint95
D0 Run II (FNAL)	280 TB/yr	4,075 SPECint95
CDF Run II (FNAL)	464 TB/yr	3,650 SPECint95
ATLAS (LHC)	1100 TB/yr	2,000,000 SPECint95

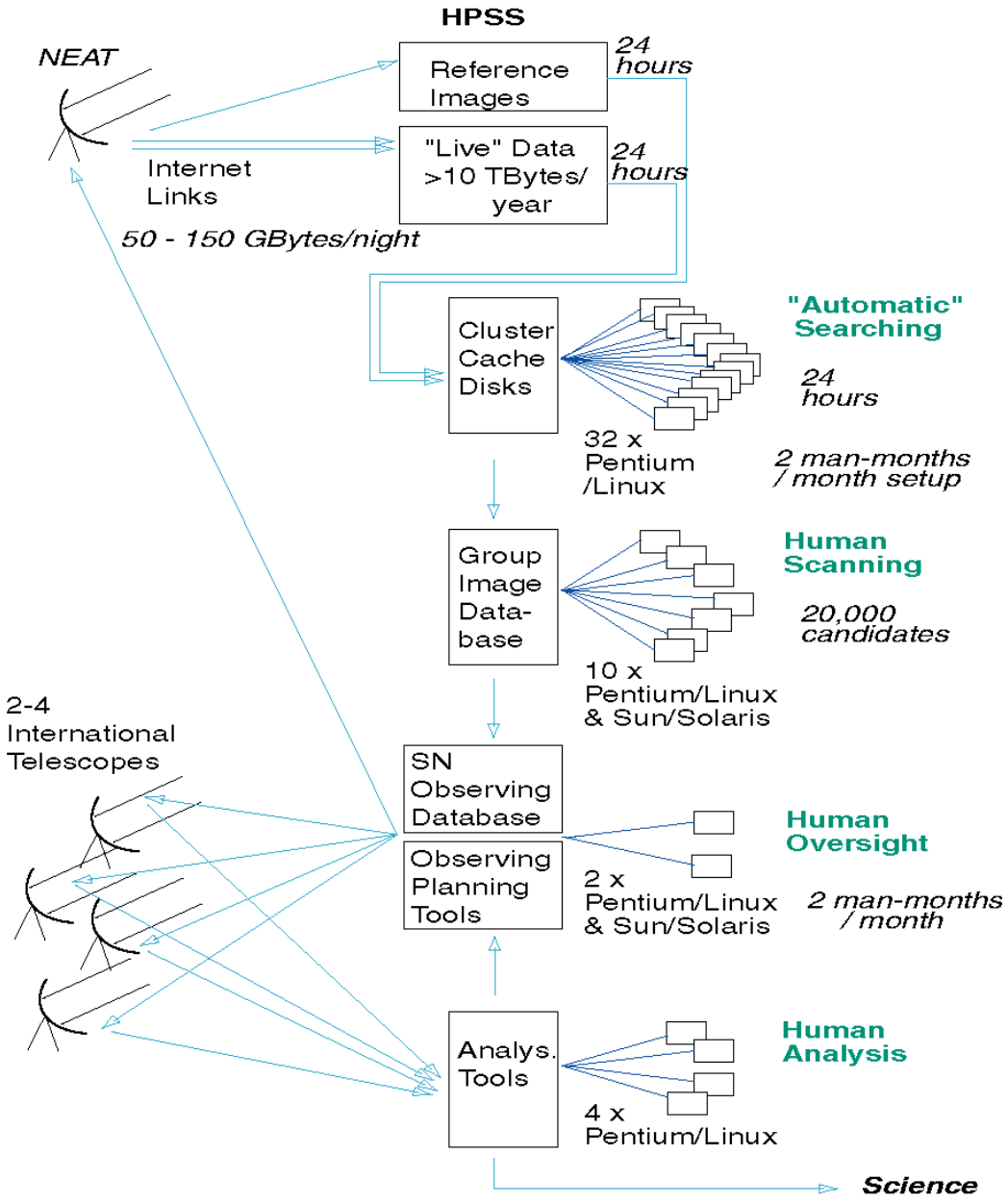
Existing Infrastructure

- **R&D plan builds on an existing close collaboration with the National Energy Research Scientific Computing Center (NERSC) at Berkeley Lab**
  - **—Cray and IBM Supercomputers**
  - **—HPSS Mass Storage**
  - **—Cluster Computing**
  - **—Data Management Expertise**
  - **—Networking and Grid Infrastructure**

Existing Expertise

- Berkeley Lab pioneered the use of Type 1a supernovae for cosmology
- SCP has developed methodology and tools (image analysis etc.) to support these studies
- Supernova Factory is pushing these tools to much higher volume (up to 1000 SN per year) providing a testbed for SNAP technologies

SN Factory Data Flow



- Software based on SCP program
- Now in use for high volume search/followup
- Tested at full data rates for 1 month
- Discovered 40 SNe

R & D Issues

- **The SCP and Supernova Factory have clearly demonstrated the feasibility of the approach and have provided a solid base of tested software for SNAP**
- **The challenge is to refine this software into full production systems for the SNAP mission**
- **We will integrate commercial tools where possible to automate data flow and reduce human intervention**

Workplan

- Document High-Level Requirements
- Complete Conceptual Design / Architecture
- Evaluate Critical Technologies
- Monitor other relevant technologies
- Develop Cost and Schedule

High-Level Requirements

- Existing software provides a foundation for defining all SNAP requirements
- We need to identify any new requirements that cannot be met with computing and software available today or likely to be available when needed
- We will document requirements to establish baseline for SNAP conceptual design and architecture

Major Components

- Data Acquisition/Control
- Calibration and Monitoring
- Workflow Management
- Data Management/Access and Storage
- Scheduling and Optimization
- Resource Reservation and Allocation
- Network Management
- Collaboration Tools
- Analysis Algorithms
- Data Presentation and Visualization

Conclusion

- **Computing and Software will be critical for the success of the SNAP mission**
- **The preliminary R&D will provide the foundation for implementation of reliable systems that meet our needs at a reasonable cost**